## D X continued

Continued from page 15

will be very busy in a professional capacity. He will probably cover the entire country and it is hoped that his busy schedule will allow him some time to visit some of the RTTY boys while over here.

Charlie, W5QCH says that when his business trip to Jamacia does come off, probably later in the year, he will attempt to make a side trip to Grand Cayman (VP5) now that activity has been established by 6Y5NY and 6Y5RA on Jamaica.

If you can possibly get to a copy of the June issue of CQ Magazine take a look on page 46. There is a good picture of Cas, KA9AK published there. He is the fellow on the lower right in the group and listed under his stateside call of WØNMH.

Since Cas and Venkat have been off the air for some time now your best bet for Asia is KR6FQ, Howie on Okinawa who has been showing up from time to time on 14 mc. at about 11-1200z.

The RTTY meeting held in Germany and Italy this past June were very well attended and resulted in RTTY sections being formed within the parent Society,

In the past information on technical matters, contests, DX activity, etc. was a hit and miss proposition with many interested parties, for example, not aware of a contest until they either heard it in progress or after it was over. The amateur journals of the A R I and D A R C will now have sections devoted to RTTY and it is requested that Groups in other countries i.e. BARTG, CARTG, and even individual endeavors such as DXpiditions send information to the following amateurs

Fro the A R I
Lamberto Rossi, I1ROL
Via S. Ilario 6
Cascina (Pisa), Italy

For the D A R C
Uli Stolz, DJ9XB
D 597 Plettenberg
In der Ostert 3
West Germany

Contest time is drawing near and full details appear elsewhere in this issue so we will confine our remarks to simply; get the gear in shape because this contest is really going to be a big one.

As for us, we are going to hang up the "Gone Fishing" sign on the door and go down to the Atlantic shores and soak up some sun for a few weeks.

73 de John

***

Return Requested
RTTY JOURNAL
P. O. BOX 837
ROYAL OAK, MICHIGAN 48068

First Class Mail --



RTTY JOURNAL
SEPTEMBER 1968
EXCLUSIVELY AMATEUR RADIO TELETYPE
Vol. 16 No. 8
30 Cents

# RTTY TROPHY WEEK END



## 8th WORLD WIDE RTTY SWEEPSTAKES- October 5-7, Sponsored by C.A.R.T.G.

Not content with sponsoring the "Best Contest Yet" last fall, the Canadian Amateur Teletype Group (CARTG) has even bigger and better plans for this fall. A hugh TROPHY WEEK END for RTTY. 16 trophys plus certificates will be awarded in what will be the most complete contest ever held for RTTY exclusively. There is even a trophy for the SWL. Although the contest in one sense is a DX contest, various side contests should make it of interest to anyone regardless of power, antennas, location or interests. Although possible - under the rules for one station to win two or more segments of the contest, the various divisions offer a chance for anyone to win a trophy by specializing in the division that fits their station set-up

and preferences in operating. Beautiful trophys will be awarded to each division winner and certificates to many of the runner ups. We know of no contest that has offered so many outstanding prizes for the top scorers. Although the rules are not much different from past contests the new divisions may cause some confusion, with this in mind the following paragraphs will attempt to explain each segment of the contest.

See the rules - published in this issue, for basic scoring and log keeping.

One log, for all phases of the contest will be kept. The CARTG will check each log for scores in all divisions. Just be sure that all information is entered in your log.

Note particularily that only 36 hours of the total 48 may be used during the contact. Times on and off the air must be noted in the log and although the rest periods may be taken at any time a minimum of two hours at any one time is required. Also note that an RST report is not necessary in the message form.

1. TOP HIGH SCORE
   "CARTG" TROPY AWARD
2. 2ND HIGH SCORE
   "RTTY JOURNAL" TROPHY AWARD
3. 3RD HIGH SCORE
   "RTTY BULLETIN" PLAQUE AWARD
4. 4TH TO 10TH HIGH SCORES
   "CARTG" PLAQUE AWARDS

Trophys for first three places - Engraved Medallions for next seven places. Scoring as per the rules.

5. MOST CONTACTS WITH CANADIANS, CANADIAN DIRECTOR TROPHY AWARD

Trophy for station working most Canadian stations.

6. MOST U.S.A. STATES AND CANADIAN PROVINCES worked.
   "RTTY JOURNAL" TROPHY AWARD

Trophy for winner.
In case of tie, station with largest total contacts will win.

7. LOW FREQUENCY HIGH SCORE 80-40 METERS
   "RTTY JOURNAL" TROPHY AWARD

Trophy to winner.
Zone chart scoring but contacts on 40 and 80 meters only to count.

8. 10 METER HIGH SCORE
   "CARTG" TROPHY AWARD

Trophy to winner.
Zone scoring - Highest total score with 10 meter contacts. (Because of the confusion on band restrictions in different countries we suggest that US stations call around 29050 and listen at times at 28050. A mention of tuning down - or tuning up - during a call would help avoiding confusion).

9. SWL HIGH SCORE
   "RTTY JOURNAL" TROPHY AWARD

Trophy to winner.
2 points for copying one side of a QSO-5 points for both sides.
Highest score wins. Logs should show all information of the message copied.

10. N.S.F.K. HIGH SCORE
    "CARTG" TROPHY AWARD

Trophy to winner.
Zone scoring - narrow shift contacts only. Shift must show on log.

REMEMBER - All of the above divisions can show on one log and any log is eligible for as many trophys as it can qualify for. Be sure all information is on your log- It should contain -- Band-Message number -- both sent and received. Time in GMT, Call sign -- Zone - Country or state. Exchange points -- Shift -- Rest period times--.

This is not as complicated as it may seem, if log sheets are ruled off ahead of time it is merely putting the information in the proper place as the contact takes place.

The Sponsors, CARTG, will check the logs for all divisions of the contest. THIS IS A BIG JOB and they will appreciate receiving logs as soon as possible. Deadline will be November 30, 1968. No activity of this size has ever been offered before on RTTY. We sincerely hope that everyone including the SWL, or suppose it should be SWP (Short wave printers), spends some time in the contest. Every effort will be made to have as many countries and the scarcer States represented. Some bedlam may be present, we hope so as it represents a good contest, but lets have everybody get their feet wet at least. From this experience may come the basis for other contests of interest to RTTY fans.

***



# CONTEST RULES

1. CONTEST DATES

The contest will commence at 0200 GMT Saturday October 5th and end at 0200 GMT Monday October 7, 1968.

The total contest period is 48 hours but no more than 36 hours of operation is permitted. Times spent in listening counts as operating time. The 12 hour non-operating period can be taken at any time during the test, but "off periods" may not be less than two hours at a time. Times on and off the air must be summarized on the Log and Score Sheet.

2. BANDS

The contest will be conducted on 3.5, 7, 14, 21 and 28 MHz amateur bands.

3. COUNTRY STATUS

ARRL Country List - except KL7, KH6, and VO to be considered as separate countries.

4. MESSAGES

Message to consist of:
(a) Message number - Time GMT
(b) Zone, country or state.

5. EXCHANGE POINTS

(a) All two way contacts with stations in one's own zone will receive 2 exchange points.

(b) All two way contacts with stations outside one's own zone will receive the points listed in the Exchange Points Table. (Same zone chart as used in last year's test. A copy is printed elsewhere in this issue courtesy of the SSB and RTTY Club of Italy.

(c) Stations may not be contacted more than once on any one band. Additional contacts may be made with the same station if different band is used for each contact.

6. LOGS AND SCORE SHEETS

Logs must contain: Bands, Number, exchanges and times sent and received GMT, call signs, scores, countries, exchange points, shifts and rest periods.

All logs must be received by November 30, 1968. Send to --

CANADIAN Amateur Radio Teletype Group
85 Fifeshire Road
Willowdale, Ontario, CANADA

7. MULTIPLIERS

A multiplier of one is given for each country worked including one's own, on each band. e.g. If one country worked on three bands, then 3 points is given.

8. SCORING

Total number of Exchange Points multiplied by number of Countries worked, multiplied by number of Continents contacted (maximum of six).

Scoring Example

Exchange Points . . . (2020)
Countries . . .
3.5 MHz - 5
7 MHz - 4
14 MHz - 18
21 MHz - 10
28 MHz - 3
Total - 40 Continents . . . (5)
2020 xx 40 x 5 -- 404,000 Points

***

## FSK for the DRAKE T4X and R4A

One of the most versatile pieces of gear employed in amateur RTTY today is the Drake Line - T4X and R4A. R.L. Drake has made provisions to easily adopt the vfo in their gear by providing an external lug outside the vfo can. They also provide literature on how to fsk their equipment which is essentially Mainliner keying as outlined by Irv Hoff, and can be found in the QST series he wrote in 1965.

Despite the thorough job that Drake has done there seems to be one thing which they overlooked. A number of Drake owners have had difficulty when attempting to make the modification as outlined by Drake. They have been unable to attain the desired 850 shift or have had trouble maintaining a stable shift. The trouble is often cured by providing additional isolation to the collector of Q1, 2N3394. This is accomplished by changing the input of the FSK voltage to the junction of R44, an 82 ohm resistor, and C86. Once this is done the shift is easily attained according to directions given by Drake. The solution was suggested by K40AH when I mentioned the problem to him while in QSO.

In order to make the modification it will be necessary to remove a few of the tubes behind the vfo can, the spring where it attaches to the can, and then the can itself. Care should be taken in doing this so as not to upset the dial calibration. Once the can has been removed trace the lead from the FSK lug to resistor R44 (82 ohms) and unsolder it at this point. Then lengthen the lead and solder it to the other side of the same resistor (R44). Replace the can, the spring and the tubes, and you are in business.

WA2YVK Frank Fallon

***

# EXCHANGE POINTS TABLE

| YOUR zone | CORRESPONDENT zone |
|---|---|
| 1 | 2 14 10 13 16 22 20 25 30 36 37 39 21 19 20 25 16 28 25 29 34 39 35 14 36 25 29 34 39 40 47 44 15 6 |
| 2 | 14 2 15 8 7 16 12 16 23 24 30 30 12 14 16 19 17 11 25 29 29 22 16 28 25 31 40 50 25 47 14 21 21 28 33 36 37 6 20 |
| 3 | 10 15 2 8 11 9 13 14 18 21 28 28 26 28 27 21 32 37 39 32 31 26 30 28 35 40 50 50 25 47 14 21 21 28 33 36 37 6 20 |
| 4 | 13 8 8 2 3 8 10 12 18 22 26 26 22 26 27 19 21 23 26 26 22 26 33 37 34 30 40 45 54 46 22 41 19 27 24 31 38 39 42 13 |
| 5 | 15 7 11 3 2 9 9 6 10 17 20 24 25 18 20 22 26 26 24 35 32 38 33 35 31 41 40 45 54 46 22 41 19 27 24 31 38 39 42 13 |
| 6 | 18 16 9 8 9 2 4 7 10 12 19 19 21 27 29 31 34 33 29 34 40 40 46 40 40 33 46 42 49 47 38 17 32 28 36 30 37 44 43 48 22 |
| 7 | 22 16 13 10 9 4 2 4 6 8 15 15 17 26 29 31 35 36 33 33 40 47 42 38 42 37 44 44 38 50 46 53 49 40 22 34 26 33 40 38 44 22 |
| 8 | 20 12 14 8 6 7 4 2 4 5 11 15 18 19 22 24 27 31 32 30 29 35 42 38 42 38 42 37 47 46 51 54 44 24 38 36 41 41 13 |
| 9 | 25 16 18 12 10 6 5 2 8 10 14 15 23 25 29 33 35 34 29 35 42 45 41 45 41 50 50 55 52 45 28 38 21 30 23 38 36 41 41 13 |
| 10 | 30 23 21 18 17 12 8 11 8 2 9 7 9 31 33 37 41 43 41 36 42 51 49 52 45 58 52 54 44 37 28 31 28 36 24 29 38 31 38 39 27 |
| 11 | 36 24 28 22 20 19 15 15 10 9 2 9 7 26 28 33 36 41 43 30 34 42 45 51 52 49 55 49 42 41 37 35 22 29 16 20 28 23 29 27 |
| 12 | 37 30 28 25 24 19 15 18 14 7 9 2 9 3 35 37 41 45 49 48 39 42 49 53 58 50 52 52 48 37 33 32 27 31 37 34 27 33 34 |
| 13 | 39 30 30 27 25 21 17 19 15 9 7 3 2 33 35 40 43 48 49 37 39 46 50 56 53 50 52 46 34 34 35 29 34 21 24 30 24 30 34 |
| 14 | 21 12 26 19 18 27 26 22 23 31 26 35 33 3 2 33 35 40 43 48 49 37 39 46 50 56 53 50 52 46 34 34 35 29 34 21 24 30 24 30 34 |
| 15 | 22 14 28 21 20 29 29 24 25 33 28 37 35 3 2 5 9 11 14 18 17 23 27 25 29 30 39 47 36 54 6 7 15 18 19 25 24 8 |
| 16 | 19 16 17 23 22 31 31 27 29 37 33 41 40 6 5 2 4 8 13 6 10 15 12 18 22 21 24 26 36 42 33 49 10 9 20 21 21 27 25 9 |
| 17 | 20 19 29 26 26 34 35 31 33 41 36 45 43 10 9 4 2 5 12 7 8 12 8 14 19 17 20 22 32 38 32 45 14 10 22 22 20 27 23 12 |
| 18 | 26 26 32 35 43 41 49 48 14 13 8 5 2 7 12 7 2 6 11 14 15 20 30 30 35 29 40 13 15 27 28 24 31 27 14 |
| 19 | 11 19 21 22 24 29 33 30 34 41 43 48 49 18 18 13 12 7 12 18 2 6 19 16 10 9 16 15 20 30 30 35 29 40 13 15 27 28 24 31 27 14 |
| 20 | 25 19 32 26 35 34 33 29 29 26 30 39 37 7 6 6 7 12 18 2 6 14 14 20 26 21 26 25 34 43 35 49 8 3 15 16 15 22 20 12 |
| 21 | 29 25 37 33 32 40 40 35 35 42 34 42 39 14 11 10 8 12 19 6 2 9 11 17 24 16 21 20 28 37 40 43 14 6 18 16 11 19 15 19 |
| 22 | 23 31 39 37 38 47 46 42 43 51 49 46 21 18 15 12 12 16 14 9 2 9 11 17 24 16 21 20 28 37 40 43 14 6 18 16 11 19 15 19 |
| 23 | 22 26 32 32 33 40 42 38 41 49 45 53 50 19 17 12 8 6 10 14 11 6 2 6 10 18 11 21 29 36 35 37 22 14 26 16 29 26 21 28 22 20 |
| 24 | 22 30 31 34 35 40 44 42 45 52 51 58 56 25 23 18 14 11 10 20 17 10 6 2 6 13 6 10 20 24 30 31 37 22 16 29 26 33 25 32 25 25 |
| 25 | 16 28 33 33 38 37 41 45 52 50 53 27 27 25 22 19 14 16 21 16 21 17 15 16 21 16 7 8 6 13 2 6 9 15 23 30 18 27 32 28 41 40 33 25 |
| 26 | 28 35 37 40 41 46 50 47 50 50 49 52 50 53 27 27 25 22 19 14 16 21 16 21 17 15 16 21 16 7 8 6 13 2 6 9 15 23 30 18 27 32 28 41 40 33 25 |
| 27 | 25 35 35 38 40 42 46 46 50 52 55 52 52 52 30 29 24 20 16 15 26 21 13 12 6 9 6 2 7 15 18 25 25 34 27 40 35 27 32 26 30 |
| 28 | 31 40 40 44 45 49 53 51 55 54 49 48 46 32 30 30 26 22 20 20 25 20 11 14 10 15 5 7 2 10 17 31 24 32 42 33 34 25 36 30 37 44 43 48 22 |
| 29 | 39 50 43 52 54 47 49 54 52 44 42 37 37 42 39 36 32 30 26 22 20 20 25 20 11 14 10 15 5 7 2 10 17 31 24 32 42 33 34 25 36 30 37 44 43 48 22 |
| 30 | 35 50 35 44 46 38 40 44 45 37 41 33 34 49 47 42 38 45 32 43 37 29 30 24 30 22 18 17 9 2 24 7 51 42 47 40 33 32 29 48 |
| 31 | 14 25 11 20 22 17 22 24 28 28 37 32 35 34 36 33 32 29 21 39 40 36 31 26 18 31 15 24 2 22 2 22 39 42 46 53 52 56 51 28 |
| 32 | 36 47 32 40 41 32 34 38 38 31 35 27 29 55 54 49 45 40 36 49 43 35 37 30 27 24 32 7 22 2 57 48 47 42 38 34 33 50 |
| 33 | 25 14 29 21 19 28 26 21 21 28 22 31 29 5 5 10 14 18 23 8 14 22 22 28 32 28 32 38 32 45 14 10 22 22 20 27 23 12 |
| 34 | 29 21 35 28 27 36 34 30 30 36 29 37 34 10 7 9 10 15 21 3 6 14 16 22 28 21 27 25 33 42 6 13 15 27 28 24 31 27 14 |
| 35 | 34 21 35 26 24 30 26 23 20 24 16 34 21 15 15 15 20 22 27 33 15 18 26 29 35 41 33 40 36 39 47 46 10 2 13 12 12 18 16 16 |
| 36 | 28 42 33 31 37 33 30 27 29 27 24 19 18 21 18 15 12 14 11 21 16 22 26 33 40 29 35 30 31 40 50 42 14 12 7 2 15 18 19 25 24 8 |
| 37 | 40 48 38 40 44 40 38 36 32 31 23 33 27 22 24 33 27 22 24 33 27 22 24

work symmetrically around ground. In the ST-3, a voltage-divider network is used so that the input is half-way between ground and plus 12 volts. As a result the output voltage with no input will also be six volts. As the input varies, the output will swing plus and minus around six volts. When we separate the audio from the d.c. component in the filter stage, this plus six volts drops out of the picture. This system makes it possible to use the op amp with only one supply voltage.

5. THE FILTER STAGE

This uses two 88 mh. toroids in a linear discriminator. They are about 185 cycles wide at the -3db. points and around 290 cycles wide at the -6db. points with good crossover near 2550. They also have good balance with respect to noise input.

6. THE DETECTOR STAGE

Full-wave rectification is used for better filtering. Germanium diodes with low forward voltage drop are used for D3, D4, D5 and D6. Silicon diodes are used (D7 and D8) for the autoprint circuit.

7. THE TUNING INDICATOR

On VHF a tuning meter is of little use. On HF bands some form of tuning indicator is needed. The most simple would be to attach an external VTVM to point "A". This reads negative voltage (about -2.4 volts) for either mark or space when both are tuned correctly. Figure 2 shows how an ordinary milliameter may be added if desired. By using an emitter-follower circuit, the input impedance in this case will be about 200,000 ohms or so.

8. THE SLICER STAGE

This is just a cascaded series of transistors to give high gain. The detector output is only about plus-and-minus 1.5 volts, so the input stage was designed to have an impedance of around 100,000 ohms in order to have minimum effect on the detector circuit. The following stages merely raise the gain to where it will adequately control the keyer. For 850 shift, it could have been accomplished with two less transistors. This circuit gives enough gain to copy shifts of less than 20 cycles.

9. THE STANDBY SWITCH S-1

When S-1 is closed, Q4 then causes the keyer Q5 to go to mark. The impedance at the point where S-1 is attached is only approximately 300 ohms. The 0.001 capacitor was added for bypassing any r.f. that might be present when transmitting. A remote standby line may be added in parallel with S-1 if desired. The relay contacts K-1A are not needed, and were added primarily to show how they would be used if you do not desire motor delay control. A short article following this one describes the ST-2 without motor delay for VHF use. The relay contacts may be used for other things if desired. As shown, they do prevent the loop form going to space until the motor has been turned on. The autoprint section accomplishes the same thing, however.

9. THE KEYER STAGE

This is a 300-volt transistor. Literally any high-voltage NPN transistor may be used. The network hooked to the collector absorbs the back e.m.f. generated by the inductance in the selector magnets when they open for space. This back e.m.f. is around 75 volts for 60 ma. operation and around 150 volts for 20 ma. operation. Q5 pulls only 0.012 watts on mark and needs no heat sink.

10. THE AFSK DRIVER

As shown, this will drive most afsk units that require conduction on mark. It will also drive f.s.k. transmitters requiring conduction on mark such as the Collins S-Line and other SSB type transmitters. If you require conduction on space to be right-side up, you will need to add Fig. 3. Either this circuit or that in Fig. 3 will provide about 5 ma. conduction current to a germanium diode as normally used in f.s.k. keyers.

11. THE AUTOPRINT SECTION

This portion is based on the concept developed by Keith Petersen for the Mainline TT/L RTTY Demodulator. Since c.w. is rarely as much as 50% key down, and voice is rarely over 30% average, any system that would require an average attack-to-release of say 70-80% would ignore c.w. and voice. Since RTTY is essentially 100% key down, all we need do is sample both the mark and space channels with a system that requires a high average charge level. By making the drop-out time approximately one second, the unit then would need about 3-4 seconds of attack time to fulfill these requirements. The one-second will guard against momentary signal loss due to static bursts, noise peaks, etc., and four second attack time then integrates over such a long period of time that peak fluctuations have little effect. Thus little or no filtering ahead of the autoprint system is needed.



Q6 is biased so that with no signal it conducts, causing the large 150 mfd. capacitor to be charged fully (about 2.4 volts in this circuit.) This in turn conducts Q8 with a few microamperes of current, which causes Q9 to conduct and this in turn causes the printer to be held in mark. At the same time, the collector voltage at Q9 is about 0.2 volts so the 20 Mfd. capacitor has no charge, Q11 does not conduct and Q12 does not turn on the relay. Thus the motor is off.

When a signal appears, it puts out a negative voltage at point "A", this causes the voltage on the base of Q6 to fall and it cuts off. Q7 no longer conducts, so the 150 Mfd. capacitor slowly bleeds off through the 27K resistor. When the voltage falls to about 1.7 volts, Q8 stops conducting, Q9 no longer conducts and now Q10 stops conducting, so now the printer gets its signal from Q2 and the detector circuit. At the same time, the voltage on the collector of Q9 is high and the 20 Mfd. capacitor charges quickly, allowing Q11 to conduct. This causes Q12 to conduct and this turns the relay on which starts the printer motor.

When the signal stops, Q6 again conducts, Q7 conducts, and now charges the 150 Mfd. capacitor. In about one second, it has charged enough to turn on Q8 and this causes Q9 and Q10 to conduct, putting the unit back into mark once more. Now the 20 Mfd. capacitor bleeds off slowly through the 1 meg resistor and the emitter-follower. The capacitor had been charged to approximately 11 volts, and must discharge to about 0.6 volts before Q11 stops conducting. This will take about 30 seconds. At that time, the motor will shut off.

12. WHY HAVE MOTOR DELAY?

On VHF, motor delay is of little use, and the article following this will describe the Mainline ST-2 without motor delay. On HF, where lengthy QSO's are customary, stations must send c.w. after terminating each transmission. It may be 10-15 seconds from the time one RTTY signal stops until another starts, due to c.w., station change-over delays, etc. If no motor delay were provided, the motor would be constantly turning on and off at the end of each transmission. With 30 second delay, the motor will normally stay on until the QSO has terminated. This makes continuous monitoring via "autoprint" entirely practical. It is beneficial even on VHF, but to a lesser extent. There, most fellows send only an occasional message and use the microphone on the same frequency the rest of the time.

13. WHERE IS AUTOPRINT USEFUL?

Answer: Anytime you are interested in RTTY. Just that simple. With this system, you can leave the receiver run 24 hours a day. Anytime a station comes on with RTTY, the printer will start up, and when the signal stops, the printer turns off, and shortly thereafter turns the motor off also if nobody comes back on the frequency. You can see where this is of immense help for ordinary monitoring. You can leave to go to the kitchen during a QSO. You can tune in the receiver and go mow the lawn. You can leave the receiver on a MARS frequency or net freq. and come back the next day and see who said what. I leave my units running even when I leave town for a few days.

14. HOW DOES "AUTOPRINT" DIFFER FROM "AUTOSTART"?

It's really one and the same, but "autostart" seems to scare off a lot of people who don't really recognize how convenient it is to have a fully automatic system even for everyday use. The term "autostart" has come to mean "fixed frequency operation" to most fellows. Perhaps this new term "autoprint" will be more meaningful. It merely indicates a fully automatic receiving RTTY system for any frequency or any purpose.

15. ADJUSTMENTS

Short the input to ground. Adjust the 10K pot on the limiter so that the output voltage at pin seven is one-half that of the supply voltage at pin 3. In other words about plus 5.5 volts roughly. It's not at all critical. This balances the "offset input voltage" so that the "op amp" will have maximum gain. A pot is not even needed. You can substitute fixed resistor values in place of a pot until you approach 5.5 volts on the output with no input.

The 10K pot on the output is adjusted so that mark and space have equal voltages as measured at point "A".

Tune the 88 mh. toroid across the 0.068 capacitor to 2125 by removing an equal number of turns from each of the two windings. Tune the other toroid to 2975 in a similar manner. You may have to try several 0.033 capacitors to find

one that comes out to 2975 or lower. If it comes out higher than 2975, you can't do anything about it except to add a little more capacitance. It's far easier to find a capacitor that comes out a little lower, and then remove turns of wire to get back to 2975.

The 1.2 meg. resistor in the base of Q1 biases the diode to approximately 0.6 volts with no output from the detector, so that a tiny voltage change on the detector output will then cause the printer to go to mark or space. If you can accurately determine 2550 frequency, you can hand-pick a resistor that will give space for all frequencies higher than 2550 and mark for all frequencies lower than 2550. The 1.2 meg resistor should be quite close, depending upon the accuracy with which you were able to tune the filters.

The 100K resistor on the base of Q6 sets the point at which Q6 operates with respect to the incoming signal. The value shown should give about plus-and-minus 150-175 cycles bandwidth of operation on the autoprint. That is, a signal can drift somewhat, or have the wrong frequency initially to some extent. A 120K will cut this down to about plus-and-minus 100 cycles.

The 56 ohm resistor in the low-voltage power supply may be adjusted so that the Zener diode has between 10 and 30 mills of current through it.

16. THE SWITCHES

S-1 is the receive-standby switch. (shown in receive)
S-2 is the autoprint normal-off switch. (shown in autoprint normal)
S-3 is the motor on switch. (shown in automatic)
S-4 is the power on-off switch.

We suggest you install the switches so that when all are "up", you are in normal autoprint. Then when you leave the room, you can glance at the unit and know you are in automatic configuration.

17. THE COST

The cost break-down with the parts we selected is as follows:

| | |
|---|---|
| Input-limiter sections | $ 5.90 |
| Filter-detector stages | $ 4.80 |
| Slicer-Keyer stages | $ 6.35 |
| Autoprint with motor delay stage | $13.31 |
| Power supplies | $16.60 |
| Total Cost | $46.96 |

This includes the two toroids, but not the AC power cord or chassis. The entire unit less autoprint section (which can easily be left off) then costs only $33.65, and if the two diodes (D7 and D8) at point "A" plus the 0.05 capacitor are left off, the total price then becomes $32.94. Now regardless of how simple other solid-state "TU's" might appear to be when published, if you price them out, most are in the $35-$40 price region, as they often use "FET" transistors, or expensive power transformers, etc. that quickly add to the cost.

18. THE AUTOPRINT SECTION AGAIN

You will note that the autoprint section itself works independently of the slicer-keyer stage. As such, you can easily adapt this section to almost any existing converter! You should refer to the following article on the "ST-2" that offers autoprint without motor delay. Total cost of that, less the 12 volt power requirement, is about $11. Thus for this price you could add the autoprint section to your present W2JAV or military surplus unit quite readily. You would need to add two diodes such as D7 and D8 plus the 0.05 capacitor for filtering. Then if the voltage at your new point "A" is not around -2.5 volts, all you need do is fix a voltage divider to ground so it is. Let's say you are getting -50 volts at that point. We only want about -2.5, so take a 2.0 meg resistor in series with a 100k to ground. The junction of the two will be about -2.5 volts. Simple. The relay would then short out the "standby" switch to put the unit into automatic operation. Let's say you had -33 volts. Then a 1.2 meg resistor in series with the 100K to ground will do it. Etc. Of course the relay still hooks to the loop supply voltage. Adjust the size of the series resistor to the relay (shown on the ST-3 diagram as a 4700 ohm) to get the proper current through the relay -- 11 mills if you use the P & B KA11DG or similar.

This will give you full autoprint on any existing converter for around $11 or so if you have an external 12 volt power supply. Or you can copy the one for the ST-3. It will not give you motor delay, of course.

19. PERFORMANCE

The ST-3 will give full printer range. On my model 19, I get about a 85 point range on local loop, and I get the same 85 point range from off-the-air tests, indicating virtually no distortion introduced by the ST-3.



If you adapt this to your present audio converter, refer to the ST-3 diagram to see how D7, D8 and the 0.05 capacitor were added, which you can readily do to the filter section of your present demodulator, whether it is a vacuum tube design or solid-state. Read paragraph 18 of the Mainline ST-3 article to see how to provide the voltage necessary at point "A".

The parts used are the same as those for the ST-3, and are reviewed there. The "plus 160 volts" comes from your present loop supply, and can vary from 110 volts to 250 volts. Just change the 4700 ohm resistor accordingly to give the 11 mills current the 10,000 ohm relay requires for normal operation. As an example with a 110 volt loop you would need no resistor at all, while with a 250 volt loop, you would need a 12K 5W resistor. As shown, the ST-2 autoprint section would cost $11.14 to build. Again the parts are available from Truman Boerkoel K8JUG. The Q12 transistor of course is a 300 volt unit and needs no heat sink as it only pulls 0.0022 watts when the relay is closed and no power when it is open.

If using the 12 volt power supply from the ST-3 schematic, you may need to alter the value of the 56 ohm resistor to get 10-20 mills current in the Zener regulator. Too much more than this will possibly overtax the 1-Watt Zener

With the 27K resistor shunting the 150 Mfd. capacitor, my printer commences in 3 seconds or slightly more. It prints 5-6-7 characters before locking back up into standby when the signal stops. If you want a slightly longer attack time to give even further protection against c.w., use a 33K resistor in place of the 27K. When run in parallel with the TT/L on the same audio signal, the copy was almost identical, and the autoprint operation seemed a bit more satisfactory on the ST-3, even.

20. PARTS

All parts were new, and are easily obtained. The "op amp" is the GE PA-238 and the price is an amazing $3.30! The pots are Mallory for 39¢ each. The 20 Mfd. 15V capacitors are Sprague 30D types at 57¢; the 150 Mfd. capacitor a Sprague 30D at 81¢; the 4600 Mfd. a Sprague 36D at $1.85, the 40 Mfd. a Sprague TVA-1522 at 93¢. The relay is a Potter and Brumfield KA11DG at $4.30. The D3, D4, D5 and D6 diodes are germanium 1N270 type at 32¢; D1, D2, D7 D8, D9 and the ones in the low voltage power supply are Westinghouse 1N4816 50 volt PIV at 28¢; D10 and the ones in the high voltage power supply are Sarkes-Tarzian VR-12 at 62¢, the switches are AH&H at 62¢. The loop transformer T-1 is a Stancor PA-8421, the low voltage transformer is any 12 volt transformer, we used the Stancor P-8391 for $3.39. The PA-8421 is $4.65. Q5 and Q12 are any 300 volt NPN -- we used the Motorola MJE-340 at $1.06. The RCA 40321 at $1.24, etc. may be used. Q2, Q7 and Q10 are "PNP" type transistors and may be any silicon type at all, we used Motorola MPS-3702 at 45¢. The other transistors are normal "NPN" type and again any silican types at all may be used. We used Motorola MPS-3394 at 39¢.

That should take care of the unusual components in the schematic.

21 OBTAINING PARTS

All parts may be obtained from Newark Electronics Corp. either separately, or as a total package by writing:

TRUMAN BOERKOEL K8JUG (ST-3)
NEWARK ELECTRONICS CORPORATION
2114 SOUTH DIVISION AVENUE
GRAND RAPIDS, MICHIGAN 49507
(phone 616-452-1411)

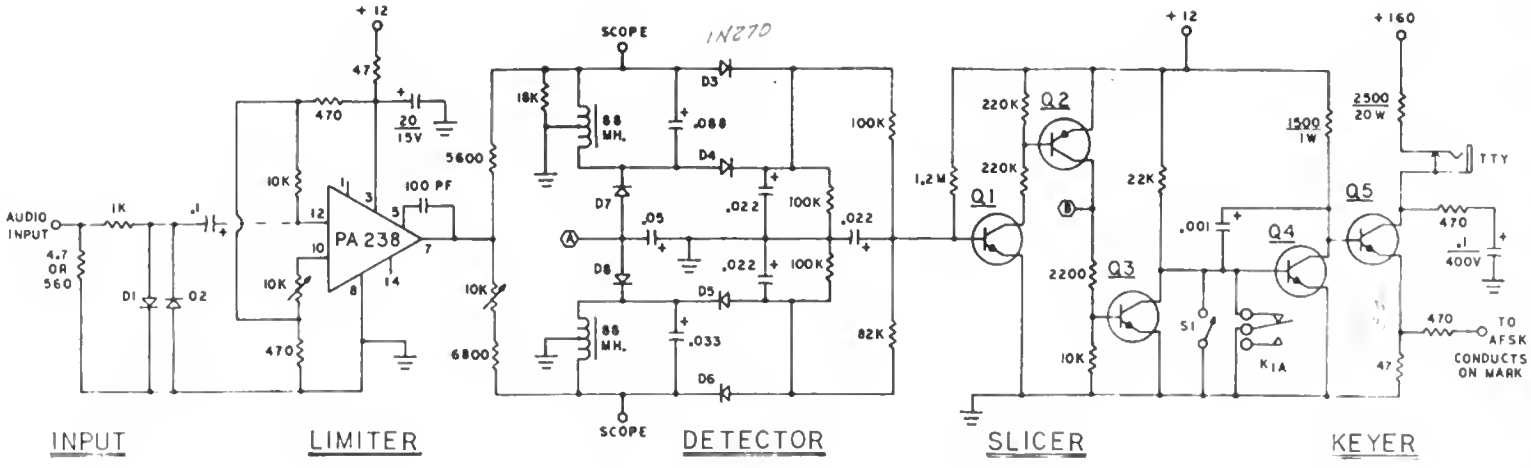
22. SUMMARY

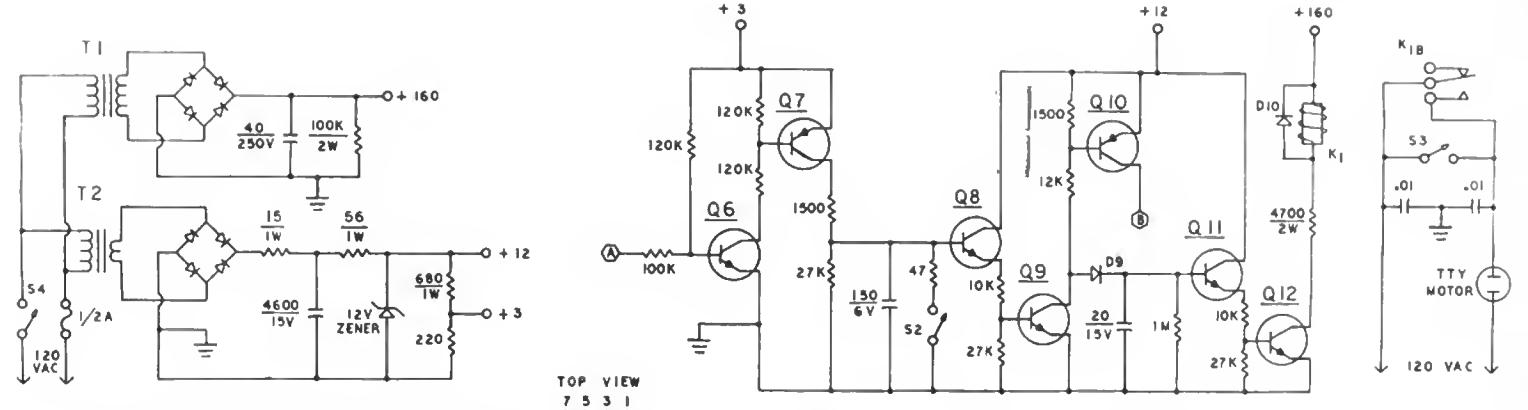
The Mainline ST-3 is the first demodulator to be published using the new integrated linear operational amplifier. This one $2.30 unit completely replaces the entire front end of the TT/L and TT/L-2, giving in excess of 60 db. of limiting. While the ST-3 was designed originally with VHF in mind, autoprint with motor delay was added, giving a modest cost ($47) unit having many of the deluxe features of units costing many times as much. The unit only draws approximately 40 mills at 12 volts, so may be left running continuously at literally no expense. It should prove ideal for monitoring MARS frequencies, traffic nets, or in general monitoring where the operator would appreciate having fully automatic reception.

Our thanks to Jon Schmidt WA3DZK for calling the GE PA-238 to my attention, and in particular to Vic Poor, K3NIO for patiently helping me learn the basics of operational amplifiers.

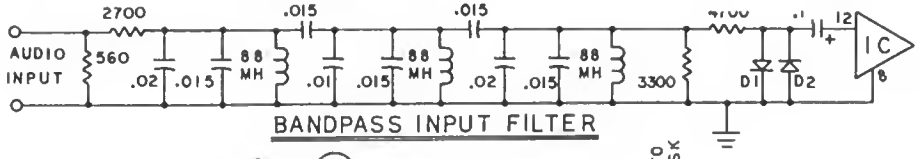
Irv W6FFC

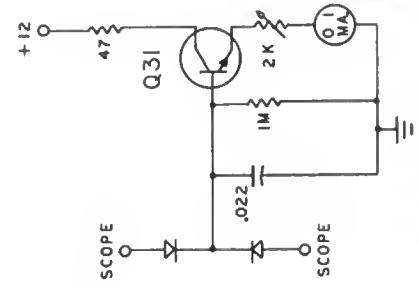
Drawings on Following pages.

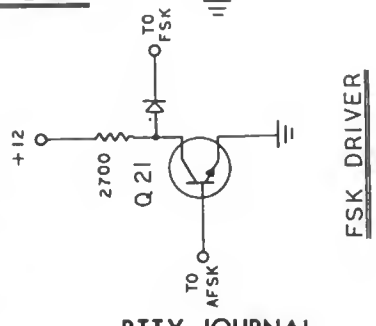



## THE MAINLINE ST-3 RTTY DEMODULATOR W6FFC






## Mainline Auto-Print System for other Demodulators.

Many people have built the Mainline TT/L and TT/L-2 RTTY demodulators (using vacuum tubes) primarily for the autostart feature. Now you too can have a similar feature on the demodulator ("TU" or "converter" if you perfer) that you are currently using, in all probability.

On VHF, motor delay is sometimes more of a nuisance than an advantage. By using the autoprint system shown here, it saves you $2.17 by eliminating motor delay.

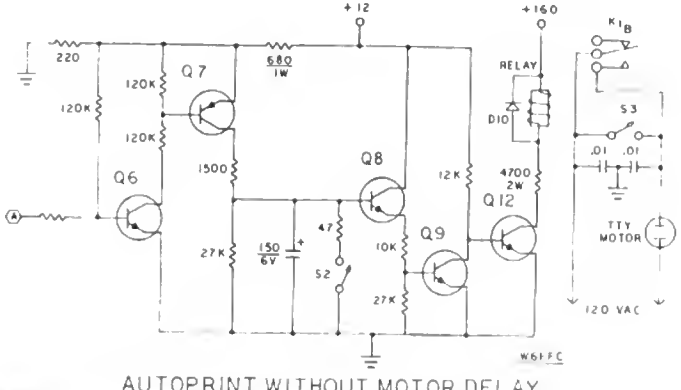
If you use this version of the autoprint, your demodulator then would be called a "ST-2" instead of a "ST-3". (This version was developed prior to the motor-delay system used in the ST-3).

Literally anybody can adapt this system to his present audio demodulator. All that is needed is an external source of 12 volts (you can use the power supply section of the ST-3 in which case you will note the 680 ohm and 220 ohm resistors are already incorporated in this design). You will also need to connect the one set of relay contacts across the standby switch as shown in the ST-3 diagram to keep the unit in standby while the motor is off and there is no signal.

***

Just before press time we have word that a printed circuit board is now available, for the ST-3 Demodulator, from Truman Boerkoel, K8JUG. The board will accommodate everything, except the power transformer and the switches which fit on the panel or chassis. No price was given but we assume it will be in the $5-$7 range.

***




AUTOPRINT WITHOUT MOTOR DELAY

# RTTY theory & applications.

RON 'RG' GUENTZLER, W8BBB
Route 1 Box 30
ADA OHIO, 45810



TRANSMITTING A RTTY SIGNAL

This month we will discuss transmitting a RTTY signal. It may appear a bit backward to discuss transmitting a signal before the process of receiving is considered because all amateurs receive before they can transmit (some for years!). However, if you know what you are trying to receive, it should be easier to understand why the receiving equipment is constructed and operated as it is.

TYPES OF SIGNALS

There are many ways to transmit a RTTY signal. Three simple methods are:

1. On-off keying
2. Frequency shift
   a. RF (FSK)
   b. Audio (AFSK)

The first method listed is the most obvious, especially when one is familiar with CW and the analogy between CW and RTTY that was described previously. In a simple telegraph loop, the signal is sent by opening and closing the keyboard contacts; because the keyboard contacts just open and close, it should be possible to substitute the keyboard contacts for a telegraph key on a CW transmitter and have "instant" RTTY.

This scheme will work and has been employed, but, although it represents the ultimate in simplicity for the "sender", the "receiver" may be faced with a serious problem. With this simple scheme, a mark is something and a space is nothing. What happens when a burst of static comes along? A burst of static is something, therefore the receiving equipment mistakes the static for a mark and prints an error; the simple on-off scheme is prone to errors. (One might argue that CW is amazingly free of such problems, and on-off RTTY should be also. However, when employing CW there is one additional item that is not employed in RTTY. It is a mass of grey matter located between a pair of ears. It is capable of doing things that no electronic circuitry can come close to matching.)

FREQUENCY SHIFT KEYING

For the time being, we will ignore the differences between audio frequency shift keying (AFSK) and carrier frequency shift keying (FSK) and discuss their common features.

In a frequency shifting scheme, something is always being transmitted; i.e., the transmitter is always sending RF into the antenna. For example, whenever a mark is to be sent, the output from the sending end is a particular frequency, and when a space is to be transmitted, a different frequency is sent. Because there is always a mark or a space being sent, the receiving equipment has a much easier time deciphering the signal.

This will be explained fully at some later date, but a brief explanation follows: The receiving end can copy from mark only because a knowledge of the marks implies that there are spaces between the marks. If only spaces are received, marks must be in the "gaps" between the spaces. Therefore, if both marks and spaces are sent, the receiver can use either one and obtain all the information sent. If bursts of noise are present, the receiver can employ a simple scheme where it uses both marks and spaces in such a manner to reduce its sensitivity to interference.

FSK

Carrier frequency shift keying (FSK) is most commonly employed on the HF bands (and is the only legal means of transmitting RTTY on these bands; see for example, pages 13 & 14 of the 1968 Edition of THE RADIO AMATEUR'S HANDBOOK: FSK is called F1 modulation).

Usually, the carrier frequency is shifted by placing a small capacitor across the oscillator tank circuit. The capacitor is connected and disconnected by the keyboard contacts. When the capacitor is connected, the frequency of the oscillator is



lowered, which results in a lower transmitted frequency (unless a heterodyne system that inverts relative frequencies is employed within the transmitter).

Because of the unsuitability of conducting RF into the keyboard contacts, a few simple components are placed between the keyboard contacts and the frequency-shifting capacitor. These components are typically a capacitor, a diode, and RF choke, and a few resistors. The diode is used as a switch to connect and disconnect the shifting capacitor. The other capacitor and the RFC are used as a simple low-pass filter to block RF from the contacts.

We will not attempt to describe a specific circuit for many reasons. The most important reason is that we have had very little experience with FSK transmitters. Another reason is that the FSK circuit is to be added to an existing transmitter (in most cases) and the exact component values most cases) and the exact component values and modification method is dependent upon that particular transmitter. (Ask Dusty how many requests he gets regarding FSK'ing a particular transmitter.)

There is a great amount of information available regarding the FSK modification for specific transmitters. See for example the following: 1. THE NEW RTTY HANDBOOK, Byron Kretzman, Cowan Publishing Co., (CQ), pp. 121-9. 2. THE RADIO AMATEUR'S HANDBOOK, 1968 Ed., p. 291. 3. A series of articles by Irv Hoff appearing in QST during 1965 as well as many articles by Irv in recent issues of this publication. 4. Practically every other issue of this publication; the most recent being on p. 8 of the 1968 June issue.

Again, an FSK signal can be generated by connecting and disconnecting a small capacitor across the oscillator tank in a transmitter in response to the opening and closing of the keyboard contacts in the teleprinter.

Normally, the space frequency is lower than mark. A little reflection will reveal that if the keyboard contacts were used to add the shifting capacitor without any intervening circuitry (assuming that RF in the contacts were acceptable) the mark frequency would be lower than space. (This can happen, thus a reversing switch is usually employed in the receiving equipment to permit copying someone who is sending "upside-down".)

Typically, space is 850 Hz lower in frequency than mark. (By law it must be less than 900 Hz). Some amateurs are using a shift of 170 Hz; this is called "narrow shift". Narrow shift has many advantages compared to 850-shift, and only one disadvantage; the disadvantage is that both the transmitter and receiver must be stable (free from frequency drift problems).

AFSK

On 6 meters and above, audio frequency shift keying is permissable. (FSK is also permissible).

AFSK is usually obtained in the same general manner as FSK, but the frequency of an audio oscillator is shifted. The output from the oscillator is fed into the audio input of a transmitter.

The most common method used to obtain AFSK is to build an audio oscillator whose output frequency is as high as possible within legal limits. Usually 2975 Hz is used. A capacitor can be placed in series with the keyboard contacts and the combination is placed across the oscillator tuned circuit. When the contacts are open (space), the output of the oscillator is 2975 Hz. When the contacts are closed (mark), the resonant frequency of the circuit is lowered because of the additional capacitance and the output frequency is lower. The most common frequency for mark is 2125 Hz (850 Hz lower than space). (Note that with FSK mark is the higher frequency whereas with AFSK mark is the lower frequency).

The oscillator containing the shifting capacitor and usually a few other components including a diode to do the actual switching in order to keep the audio out of the keyboard contacts is called a keyer. The keyboard contacts are connected to the input of the keyer and the output of the keyer is connected to the audio input (microphone input) of an AM or FM transmitter.

When an AM transmitter is used, the modulation is called A2. When an FM transmitter is used, the modulation is called F2. When an SSB transmitter is used, the modulation is called F1 or illegal depending upon the harmonic content of the keyer and the amount of carrier suppression in the SSB transmitter. (Note that an AFSK keyer into an SSB transmitter results in an output that looks like carrier frequency shift keying so long as the keyer is well-designed and the SSB transmitter is adjusted properly. Irv Hoff has some comments on this subject in the 1967 OCT issue pp. 4-5 and is expected to have more

Continued on page 19

# RTTY-DX

JOHN POSSEHL - W3KV
Box 73 Blue Bell, Pa., 19422



Hello there. . . . .

It seems that it has been a long time since we last met on these pages but the calender says that its only been about two months. For RTTY-DX it certainly has been a busy Summer. Many new countries were activated for the first time. Some were anticipated, as we had talked about them for some months past, but then some came on without prior information and this always adds some hectic moments to DX chasing. In many cases, if you miss them today they are not there tomorrow.

In reviewing the DX activities for the past two months we must start off with the tremendous effort made by Maurizio, 11BPD. As you know, a schedule of events for this DXpidition had been previously published on these pages and by QST transmissions on the air so that when July 1st came you can bet there were a lot of machines and equipment waiting for the first sign of activity. As you perhaps now know, it was necessary for Maurizio to re-schedule the DXpidition due to problems with licensing authorities in the countries of southern Europe and based upon on the air information we understand that he spent a good deal of time in London trying to iron out these difficulties. The patience of the RTTY-DXers was finally rewarded on the evening of July 10th when Maurizio opened up as CN8BPD. It seemed that everyone on RTTY was waiting as the frequency was complete bedlam. I can imagine that Maurizio with the portable equipment he had to use found it impossible to copy anything. To the rescue came Giovanni, 11KG. In a short time Giovanni made order out of chaos by listing the stations calling and then feeding the calls to Maurizio. It worked out real well and in a short time all callers had a QSO.

Now that the DXpidition had started it was a waiting game as to what would follow. It was not a long wait as Maurizio was active as 7X2BPD on the 12th, 3V8PD on the 15th, and IP1BPD on the 17th. The last one being from the island of Pantelleria off the coast of Sicily. For DXCC purposes however it counts the same as italy. It is believed that it was the first use of this prefix in any mode.

I know that all RTTYers are grateful to Maurizio for putting these new countries on the air as a RTTY only effort. Although we do not have a factual account of the trip as yet you can believe that it was not without its problems with authorities, with equipment, and with travel. I'm sure that many of us would have given up before the first QSO under similiar circumstances. Our thanks also to Giovanni who probably had no sleep for the whole period. He certainly did an excellent job in keeping some semblance of order on the air and was of invaluable help to Maurizio in assisting as best he could with all the problems encountered. QSL's go to Maurizio Borghetti 11BPD, Ponte Buggianese (Pistoia), Italy.

## DX HONOR ROLL

| | | | | | |
|---|---|---|---|---|---|
| 1. | ON4BX | 77/70 | 23. | W8CAT | 31/27 |
| 2. | FG7XT | 85/68 | 24. | W4EGY | 25/26 |
| 3. | 11KG | 75/68 | 25. | K4VDM | 33/25 |
| 4. | W3KV | 73/68 | 26. | K6EV | 27/25 |
| 5. | ON4CK | 64/55 | 27. | VK2EG | 33/24 |
| 6. | W4AIS | 62/53 | 28. | YV5CIP | 30/24 |
| 7. | W8CQ | 61/53 | 29. | W8GPB | 45/23 |
| 8. | K8YEK | 59/52 | 30. | W0HAH | 32/19 |
| 9. | W6CG | 51/46 | 31. | W3AVQ | 22/19 |
| 10. | W1GJK | 50/44 | 32. | VP9BY | 26/18 |
| 11. | VE3AYL | 48/40 | 33. | K9QNV | 24/17 |
| 12. | WA6WGL | 48/40 | 34. | WB6QFE | 24/17 |
| 13. | K8JTT | 39/34 | 35. | VE4FG | 23/17 |
| 14. | W3ISE | 47/33 | 36. | OA4BR | 22/15 |
| 15. | UA1KBW | 36/33 | 37. | ZL2ALW | 18/15 |
| 16. | WB6ADY | 35/33 | 38. | W6TX | 20/15 |
| 17. | 11ROL | 45/32 | 39. | G3LDI | 25/14 |
| 18. | VE4BJ | 33/31 | 40. | PJ2CR | 23/14 |
| 19. | K8QLO | 42/30 | 41. | VK3NR | 32/13 |
| 20. | WA8BOT | 43/28 | 42. | W4FU1 | 33/11 |
| 21. | K2YEQ | 37/28 | 43. | HK3SO | 16/10 |
| 22. | XE1YJ | 33/28 | | | |

The next listing of the RTTY-DX HONOR ROLL will be in the December issue. Since we will also run listings of the WAC, WAS, and QCA awards please try to have the information on all awards you hold to me by November 1st at the latest. de W3KV

***

Early June brought a one-two RTTY punch from Ecuador. Both Dave, HC1MF, and Tom, HC1TH became active within a few days of each other and have been pretty busy since giving out QSO's from this rare spot. Both these fellows are engaged in NASA activities down there and Dave's home call is K5ZWI. QSL's can go via BOX 583, Quito, Ecuador.

The end of June brought another big surprise with activity from Yugoslavia. YU6ZAA became active on the 29th and although he was badly off speed at first, ON4BX and ON4CK finally got him adjusted to where he was putting out a real fine signal. While printing him on one occasion he indicated that the op was DJ3lili there on a holiday. The station was active for about a week but has not been heard since. When we get a QSL (hopefully) we hope to have more information on this operation.

I recently had a very interesting contact with Bob, ON4CK. The main interest at that time was the fact that Venkat, VU2KV was in the shack visiting with Bob prior to leaving for India. It was a pleasure to meet Venkat at the keyboard again. As indicated in the last issue he expected to be home by the end of July but he has a lot of work to do before he gets back on the air. He dismantled his station including the hundred foot stick with the Quad so it will be a little while before things are together again. He says he will surely be on for the contest however.

Here in the States early July is usually associated with fireworks but this year also brought a big bang from the other side of the globe. Louis, FK8AZ is now very much active from New Caledonia. Louis is running a NCX-5 transceiver (afsk), into a SB-200 linear, into a TA-33 beam so he is putting out an excellent signal. The machine is a Creed 7B. Thanks to Bob, WA6WGL for the above information and also for the copy he sent along, it certainly was "landline" and the west coast boys are having no trouble working him. It is a pretty good bet that you can find Louis on 14 mc. between 0600 and 0700z most any day and particularly on weekends. QSL's go to Box 14, Noumea, New Caledonia.

Recently KM6BI has been showing up a bit later than his usual 05-0600z. He has been putting tremendous signals into the east coast USA at about 11-1200z. His consistent narrow shift operation is explained by the fact he is using military FCC-3 terminal equipment which is fixed at 170 cycle shift (afsk). Answer him in narrow also as the equipment is all one integral unit for send and receive. Dick is the present operator and he is looking forward to the contest so watch for him. QSL to Box 43 c/o FPO San Francisco, Calif. 96614.

Received via Dusty an interesting letter and some page copy from John, KL7DRZ, up at Auke Bay, Alaska. John handles quite a bit of "letter" traffic with KC4USB and recently started a similar service with KC4USN at "South Pole Station". This is apparently the first RTTY activity from this base. The page copy that John sent along was really Q5; which is amazing, considering the fact we can't even hear him in these parts. If you think the weather has been too warm lately here is a short quote from the copy. "It has been down to a negative 62 below but tonight it is 26 below. However, July is usually the coldest month etc."!!!!

There has been some additional activity from down that area with signals from VP8JX. He has been worked by FG7XT, and W5QCH and heard by others. His CQ's indicate he is in antarctica possibly well south of the Falkland Islands on an ice shelf. Charlie, W5QCH says that QSL's go via GD3HQR but not to expect any until after next March as that is when the next supply ship is due in.

On July 14th Jean, FG7XT contacted Ev, WØSDN in North Dakota to make WAS. To our knowledge Jean is the first outside the US to accomplish this difficult feat on RTTY. Congratulations Jean.

Also congratulations this month for WAC go to --

Nr. 110 Jerry Tolsma W8GPB

Jerry is with the Heath Company in an engineering capacity and you may have contacted him at one time or other particularly on problems RTTY. Jerry is often at the Heath Company display at the larger ham conventions and it was my pleasure to meet him this year at Dayton.

Arthur, ON4BX is planning a visit to the USA this September. I say "visit" but he

Continued on page 20




What can be done to bring, and keep alive many of the silent keyboards? One thing we have noticed is the enthusiasm of the first RTTY contacts, stations appear, are very active then soon disappear from the bands. This is true on all modes but seems to be more prevalent on RTTY? Why?

Is it the problem of typing? Few operators can be much worse than the writer, yet we get by. Is it technical problems? We know of no group more eager to help others with any technical difficulties.

Could it be the actual contacts are not interesting? For some reason amateurs seem to have developed an exaggerated sense of politeness and etiquet. Once a QSO has started and bogged down the only way to get out is to suddenly have to do a chore, and you are sorry but you must run. Why do so many QSOs bog down?

An opening gambit of the name, report, and the location does little to get acquainted. A brag tape that starts at the left margin and doggedly works to the right margin with a string of dots or spaces and line after line laboriously gives the equipment in use even to the last piece of surplus gear used as spare does even less.

We do feel strongly however that the right kind of a tape could furnish the basis of many interesting contacts and friends.

How about trying a tape in paragraph form that gives the name, age, occupation, a little about the family and what interests the sender has in the way of hobbies or ham radio. A little about the town he lives in and a brief description of the equipment in use.

Chances are that something is mentioned that starts an interesting conversation and many times leads to a lasting friendship over the air. If there is no particular empathy surely it is not impolite to thank the person for the contact and sign. After all hams are different in many ways and no QSO should have to continue in the guise of politeness.

For many of us poorer typists a long QSO could be rather slow to a person on the other end, but better to have more things to say than nothing to say at all. For that left unsaid there is always a next time to look forward to.

If interested, make up your tape - we'll be seeing you.

***

Fred Kappler, HR2AFK of Honduras has a 26 printer and would like to find a used TU and some information on using it so he can put a "New Country on RTTY. Maybe one of our readers can help Fred. Contact him direct or we will be glad to forward any offers for help.

***

Our compliments to the Argentine RTTY hams, all six stations currently active operate narrow shift.

***

Speaking of South Americans, powerful amateur phone stations operating from 14150 and up the band have made operation with RTTY stations very difficult at times. We understand that most of the interference comes from Venezuela, Chile and Brazil, whether this frequency use is legal we do not know, but we do not remember it in past years. If it is illegal what can be done about it? In the mean time fifteen meters has no such problems and is open in fine shape most of the time. Lets do more sending and less listening on fifteen.

***

A letter from John Maxfield of Sacramento, Calif. The originator of the Commercial Stations on Rtty published last month, informs us that these are English language transmissions. He also included some corrections and additions which we hope he can include on a new chart that we can publish in several months.

***

The Interstate auto-start net has moved back to 80 meters at 3637.5. Seems that many of the fellows didn't have the necessary crystals for 40 meters. We also understand that a similar auto start net has been started on the west coast using 3617.5, but with 850 shift instead of 170.

***

Seems our interpretation of pounds, shillings and pence, even if devalued is away off. The Membership in the BARTG, along with their excellent bulletin is $3.00 not $1.00 as we mentioned several months ago. Our apologies to Arthur Owens G2FUD and hope he gets enough members at the correct price to pay for the explanations he had to send in reply to our error.

***

It seems that the biggest headache to newcomers to RTTY is installing FSK to their commercial built exciters. Last month we asked for specific articles on doing this to some of the popular exciters, Swan, Galaxy, Heath, Hallicrafters, Drake etc. We have several for the Collins that we can rerun and although many of these have appeared in past issues we feel the demand would warrant running as many as possible in one issue. In the future this could be used as reference.

The response to our request has been near zero - so we are asking again. A short article with the schematic and the process used to install in the exciter is all that is necessary. It may seem easy to you but believe me it scares a lot of fellows that otherwise might get on RTTY. During the past year we have had information on the Johnson exciters and the 100V but many of the newer exciters especially the transceivers have not been covered.

***

Jim Salter, K5BQA wishes to apologize for having no voltage chart for the TT/L-2 to go with his PC boards that he has been producing. The orders have come so fast he cannot finish his own converter. Can anybody develope and furnish a voltage chart for this popular converter.

### *Check Your Renewal Date*

Check your address stencil for expiration date of your subscription. The month and last numeral are the month and year of your expiration.

On your address stencil the month and year of the expiration of your present subscription are coded by an abbreviated month and figure. The figure being the last digit of the year. Dec. 8 - means the last issue on your subscription is December 1968.

***

## HOW-TO-DO-IT

llow to modify equipment without affecting resale value;

The principle is - put accessories on small boards with minimum connections to equipment; wire directly to pins of vacuum tubes. For example, the small FSK circuitry in my 32V3 mounts inside the VFO screened box, with short leads soldered to the pins of the oscillator tube. No circuitry is modified. Short PVC-insulated wires to pins of 6SJ7. The wires must circle the tube pins close onto the base, so as not to interfere with plug-in actions of pins.

Alternative: Mount parts on board with attached tube base for plugging into tube socket; use wafers between tube and socket for connections; avoid disturbing existing circuitry but use standard circuits with parts assembled to small boards mounted near present circuits, removable when resold. Many variations on this theme can be played.

Owners of wired-onto-printed-circuit-boards transistors and solid-state-stuff will have more trouble applying this principle to modifications. Suggest in such case that the way to FSK an encapsulated solid state circuit is to put a small inductance near the oscillator coil so as to couple in the necessary reactance and hold it in place with plastic cement or wax. Remember that the old arc transmitters were keyed this way, shifting the frequency by coupling in a coil - and shorting a few turns to shift it a few cycles. Couple up!

73 de "Papa" at W2AXR

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## BACK ISSUES —

Only back issues available are July through December 1966, December 1967 and February to date 1968. Copies are 30¢ each.

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"SAROC" Fourth Annual fun convention scheduled January 8-12, 1969, in Hotel Sahara's new space convention center, Las Vegas, Nevada. Advanced registration closes January 1, 1969. Ladies program in Don the Beachcomber. Technical seminars, FM, MARS, RTTY, QCWA, WCARS-7255. Registration $12.00 per person entitles "SAROC" participant to special room rate $10.00 plus room tax per night single or double, occupancy, admittance to cocktail parties, technical seminars, exhibit area, Hotel Sahara's late show, Sunday breakfast equal to any banquet dinner, ask any "SAROC" veteran. Brochure planned November mailing for details QSP QSL card with ZIP Southern Nevada ARC, Box 73, Boulder City, Nevada 89005

**Additional Classified on Next Page**



**Additional Classified on Page 18**

PAPER TAKE UP REEL: single circuit, manual operation with automatic stopping device and pull back feature, new-$12.50 ea. Squelch adaptor modification kit, used on SP600JX, consists of, squelch adaptor unit, tubes, knob, nameplate, cable clamp, terminal strip with 100K resistor, capacitor, skirt assembly and instruetions, new $7.00 ea. Keyboard for model 15 teletypewriter with (here ia) attachment used to set up identification, 19 function or characters, excellent $15.00 ea. Base; for model 15 teletypewriter with accessories, with govern motor $15.00, with synchronous motor, $20.00 ea. Base; for model 14 teletypewriter, receive only with accessories and attachment for W.E. 255A relay, also complete retainer, $10.00 ea. We also have teletype parts. Atlantic Surplus, 300 7th Street, Brooklyn, N.Y. 11215.

MODEL 15 TELETYPE PRINTER, keyboard and table, equipped with sync motor and 60 wpm gears. Also FF-1 terminal unit with bandpass, 2125 and 2975 hz filters. Sell as unit for $50. Will not ship. Ed Strojny, K8ZQB, 3713 Orchard Dr. Midland, Mich. 48640

SELL: 100V EXCELLENT condition, solid state rectifier, $350. BC-610 Plate transformer $30. Tektronix 513-D scope $250. Waterman dual trace small portable scope $100. CV89 perfect-$175. W4AIS, George Tate, 7 Artillery, Taulors, S.C. 29687

WANTED: SP600; eanneed adjustment, must be reasonably priced. J. Salter, K5BQA, 11040 Creekmere, Dallas, Texas. 75218

RTTY CONVERTER For Sale: Navy type CV-57, complete with connectors and receiver coupling parts, new, with manual $150. Paul Halmbacher, PO Box 217, Hartland, Wisc.,

WANTED: Frame and case for CV89/URA8A WA4UDB, RFD 5, Franklin, Tenn. 37064

SELL: 100V EXCITER perfect condition $325. also one Waterman Dual scope UPM-45 portable size $100. 4-1000A Elmac Air system sockets $12.50 ea. CV89 $175. W4AIS, 7 Artillery, Taylors, S.C. 29687.

SWAP; COLLINS 231d-20 Commercial transmitter. RTTY-MCW-CW-AM, 3000 watts output. Complete with Collins remote control unit. Like new and cost twenty six thousand dollars. Automatic selection of any one of ten Xtal frequencies between 3000 and 26000 Hz. This rig is sister to C.H.U. time signal station. Will swap for 28ASR complete or 75A-4 receiver. Will sell new Heath multi-speed chart drive model EUA-20-26 never used. Half price. VE3RH, 106-57 Waterford Dr. Weston, Ontario, Canada.

FOR SALE: MODEL 15 teletype machine (fine condition) 6 ft. relay rack, TU converter, monitoring scope, extra panels, control panel, antenna switch. $330.00. All new parts used in above. AD-22 Stereo Heath Tape recorder $160. WA8RXB, Dave Petry, RFD 2, Uhrichsville, Ohio, 44683

WANTED: MANUAL and/or Schematic for TCK-4 rectifier power supply. Type CG-20219 and TCK-4 transmitter type Cg52299. Advise price and postage. WA5CUV, Thomas Ulmer, 1409 Madison, Jonesboro, Ark. 72401

WANTED: WESTERN ELECTRIC #103 data Modem (or equivalent) for TWX service with model 28KSR. Jack Hardman, 600 Cortland St., Belleville, N.J. (201-751-3000 days) (201-239-

WANTED 500 cycle filter for Collins 75A4 also need 2.1 Hz filter. Dusty Dunn, Box 837, Royal Oak, Mich. 48068

TT/L-2 PRINTED CIRCUIT BOARD: heavy duty fibreglass epoxy, 6 x 9 with parts list, layout and enlarged schematic, postpaid in the USA: $6.00. J. Salter, K5BQA, 11040 Creekmere, Dallas, Texas 75218

## *Theory & Application*

Continued from page 13

in the near future.)

For specific circuits of AFSK keyers see: 1. THE NEW RTTY HANDBOOK Byron Kretzman, pp. 102-3; 2. "Audio Frequency-Shift Keying for RTTY", Irv Hoff, QST, 1965 June, p. 32ff; 3. "An AFSK Keyer", R.E. Guentzler, RTTY Journal, 1967 July-Aug. p. 9ff; 4. This "column" next month.

SUMMARY

Because RTTY is sent over a local loop by simply opening and closing contacts, it is possible to substitute the keyboard contacts for a telegraph key on a CW transmitter. This means of transmission is very difficult to receive except under very favorable conditions. A better method known as frequency shift keying requires the transmitter to be on continuously whether a mark or space is being sent. The carrier frequency can be shifted between two frequencies, one for mark and a lower frequency for space (FSK of F1). On 6 meters and above a voice transmitter can be used and the frequency of an audio modulating signal can be shifted (AFSK, F2 or A2). With either FSK or AFSK the frequency can be shifted by placing a capacitor across the tuned circuit in the oscillator.

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## BROAD MINDED

## USE NARROW SHIFT

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